Dr. Herrick has not expressed disapproval of the destructive methods of 'lobster-hatching' that have been practiced in certain hatcheries for several seasons past.

The subject of molting and the function of the gastroliths are exhaustively treated, the literature reviewed, erroneous ideas corrected, and many interesting observations recorded.

In Chapter IV., on the Regeneration of Lost Parts, we read, "the new limb appears to arise mainly by growth of the connective-tissue cells already present in the stump;" and, further on, "the fibrous tissue becomes gradually differentiated into the muscles, blood-vessels and nerves, as in an embryo." It is unfortunate that figures are not given illustrating this method of regeneration. The sections on Variation will supply valuable material for one interested in the lines of investigation outlined by Bateson.

Chapters XI.–XIII. deal with general questions of crustacean development and larval life, and are excellently illustrated by prints and colored plates.

We may add in conclusion that, from the breadth of the field covered, Dr. Herrick's paper will be frequently consulted, not only by those devoted to artificial fish-culture, but by working naturalists, whether embryologists, physiologists or students of variation.

H. C. BUMPUS.

BROWN UNIVERSITY.

ISOPENTANE AND HEXANE.

The Thermal Properties of Isopentane. By SYDNEY YOUNG, D. Sc., F. R. S., University College, Bristol. (Communicated to the Physical Society of London.)

The isopentane employed in this research was procured from Kahlbaum, of Berlin; the substance is obtained as a bye-product in the manufacture of amylene from amyl alcohol by the action of zinc chloride. The isopentane was purified by repeated agitation with concentrated sulphuric acid and with a mixture of sulphuric and nitric acids and by subsequent fractional distillation.

The vapor pressures were determined at temperatures from —30° to the critical point, 187.8°; the orthobaric volumes of a gram of liquid from 0° and of saturated vapor from 10° to the critical point; and the volumes of liquid and of unsaturated vapor between wide limits of temperature and pressure.

The experimental methods employed are described in the original paper and, in regard to pressure, the error due to the vapor pressure of mercury is fully discussed. The volumes of a gram of liquid and vapor were plotted against the pressure and from the isothermals isochors were constructed; it was found that at large volumes and just about the critical volume the isochors were straight, at any rate within the limits of experimental error, but that at volumes smaller than the critical volume the values of $\frac{dp}{dt}$ increased slightly with rise of temperature, whilst at volumes greater than the critical volume they diminished slightly with rise of temperature.

The formula $p=bT-a$ at constant volume (Ramsay & Young, Phil. Mag., 1887, 435, *cf.* Amagat, Compt. Rend., 94, 847), is therefore not quite, though very nearly, true for isopentane, and the results seem to confirm the conclusion arrived at by Amagat in the case of the substances examined by him that the values of b are not absolutely constant.

Values of b and $\frac{10{,}000}{bv}$ and of a and $\frac{10^{10}}{av^2}$ for volumes of a gram from 1.58 to 4000 cub. cms. are given in the original paper.

The absolute temperatures (boiling points) and molecular volumes of liquid and saturated vapor were read from the curves at pressures 'corresponding' to those adopted in previous papers on the 'Generalizations of Van der Waals regarding Corresponding Temperatures, Pressures and Volumes,' (Phil. Mag., Feb., 1892, 153; Jan., 1894, 1; Trans. Chem. Soc., 63, 1191) and the ratios of the temperatures and volumes to the critical constants were calculated. The ratios prove that isopentane belongs to Group I in the classification of substances previously adopted (Phil. Mag., Jan., 1894, 1).

The ratio of the actual to the theoretical density at the critical point, 3.73, agrees well with the ratios for the other members of Group I (3.65 to 3.83), and with that for carbon dioxide (3.62) deduced from Amagat's observations.

From these results it may be concluded that the molecules of liquid isopentane are simple, like those of the gas.

Specific Volumes of Isopentane Vapor at low Pressures. By Sydney Young, D. Sc., F. R. S., and G. L. Thomas, B. Sc., University College, Bristol. (Physical Society of London.)

The specific volumes at low pressures were determined in a Hofmann's apparatus, modified in such a manner that the volume as well as the temperature could be altered at will. This apparatus was first employed by Ramsay and Young (Phil. Trans. 1887 A. 58), but various improvements have been introduced, and are fully described in this paper.

Isopentane from Amyl Iodide. By the same authors. (Physical Society of London.)

A specimen of isopentane was prepared by the action of very concentrated hydrochloric acid (added drop by drop very slowly) and zinc slightly coated with copper on an ice-cold alcoholic solution of amyl iodide. The isopentane was purified by treatment with bromine and subsequent fractional distillation.

Determinations were made of the boiling point, specific gravity at 0°, the critical temperature and pressure and of the vapor pressures and specific volumes of liquid and saturated vapor at a few temperatures.

The boiling points, specific gravities and critical constants of both specimens of isopentane are given below:

	Isopentane from Amylene.	Isopentane from Amyl Iodide.
Boiling point (mean).....	27.95°	27.95°
Specific gravity at 0°.....	0.63924	0.63935
Critical temperature.....	187.8°	187.8°
Critical pressure.....	25010 mm.	25030 mm.
Critical volume of a gram..	4.266 cb. cms.	——

The Vapour Pressures, Specific Volumes and Critical Constants of Normal Hexane. By the same authors. (Communicated to the Chemical Society of London.)

The normal hexane employed in this investigation was obtained from Kahlbaumit; it had been prepared by the action of sodium on propyl iodide. It was purified by treatment with mixed sulphuric and nitric acids and by subsequent fractional distillation.

The vapor pressures and the volumes of a gram of liquid and saturated vapor were determined at a series of temperatures, and the ratio of the absolute temperatures (boiling points) and the volumes to the critical constants were calculated at a series of pressures 'corresponding' to those previously adopted.

Like isopentane, normal hexane was found to belong to group I, and the molecules of liquid in this case also are probably simple like those of the gas. The ratio of the actual to the theoretical density at the critical point is 3.83.

As regards the comparison with isopentane, it is noticed that the absolute temperature ratios at 'corresponding' pressures are higher for the paraffin of higher molecular weight, and in this respect the paraffins seem to resemble the esters (Trans. Chem. Soc. 63, 1252), for which the ratios increase without exception with rise of molecular weight.

In the case of the esters the volume ratios appear to be independent of molecular weight, but, for isomeric compounds, to depend to some extent on the constitution. It seems probable that this may also be the case for the two paraffins studied, but an investigation of other paraffins will be necessary before these points can be decided.

The relations of pressure to temperature at constant volume were investigated through a small range of volume (from 9 to 33 cub. cms. per gram; critical volume = 4.268 cub. cms.), and it was found that with hexane as with isopentane the values of $\frac{dp}{dt}$ at these volumes diminish slightly on rise of temperature.

Normal Hexane from Petroleum Ether. By the same authors. (Chemical Society of London.)

An attempt was made to obtain a pure hexane from 'petroleum ether' by fractional distillation by the method employed by the authors in the separation of ethyl acetate from a mixture of methyl, ethyl and propyl acetates (Phil. Mag. Jan. 7, 1894, 8). A dephlegmator 125 cms. in length, with twelve constrictions (Chem. News, 77, 177) was employed.

Each fraction was weighed and its temperature range noted and corrected for the thermometric error and for the difference between the barometric reading and 760 millims. The ratio of the weight of any fraction ($\triangle w$) to its

temperature range ($\triangle t$) gives, as a rule, a measure of the purity of the liquid, though in the early fractionations of a complex mixture this cannot always be relied on. Thus, in the 4th fractionation, the fraction coming over between 65° and 66° had the highest value of $\frac{\triangle w}{\triangle t}$, whereas in the 16th fractionation the corresponding fraction (65° to 66.85°) had the lowest value. In the first case a mixture of normal and iso-hexane was separating rapidly from the pentanes and heptanes in the petroleum ether; in the second considerable progress had been made in the separation of normal from iso hexane (B. P^s 69°0 and about 61° respectively).

After the 16th fractionation it was decided to proceed at first with the separation of normal hexane only, and after the 31st preliminary fractionation it was considered that the separation had proceeded far enough for the final series of fractionations to be undertaken (*loc. cit.*).

The normal hexane obtained by the final fractionation of the fractions boiling at and above 69.1°, when distilled from phosphorus pentoxide, boiled at 69.1° or 0.1° higher than the hexane from propyliodide; its specific gravity at 0° was 0.68478 or 1.15 per cent. higher.

The hexane was, therefore, shaken repeatedly with a mixture of concentrated nitric and sulphuric acid, when considerable heat was evolved and some m-dinitrobenzene was formed. The impurity, which could not be separated by fractional distillation, was, therefore, benzene with, possibly, some hexanaphthene.

The other fractions were separately treated with the mixed acids and after further fractionation a product was obtained boiling at 69.05° and with the specific gravity 0.67813 at 0° or only 0.17 per cent. higher than that of pure hexane.

The boiling points, specific gravities and critical constants of the two specimens of normal hexane are given below:

	Normal Hexane from Propyl Iodide.	Normal Hexane from Petroleum Ether.
Boiling point.....	69.0°	69.05°
Specific gravity at 0°.....	0.67696	0.67813
Critical temperature.....	234.8°	235.15°
Critical pressure.....	22510 mm.	22560 mm.
Critical volume of a gram...	4.268 cb. cms.	

SOME RECENT MEXICAN PUBLICATIONS.

MEXICAN men of science are doing much active scientific work, as is shown by the extent and value of the following publications:

1. *Biblioteca Botánico-Mexicana. Catalogo Bibliografico, Biografico y Critico de Autores y Escritos Referentes a Vegetales de Mexico y sus Aplicaciones, desde la Conquesta Hasta el Presente. Escrito por el* DR. NICOLAS LEÓN, Mexico, 1895.

This work of 375 pages is comparable to Sereno Watson's Bibliography of American Botany, issued a number of years since. The number of separate entries in the main alphabetically arranged list is 805, making, with those of the appendix (82), a total number of titles quoted of 887. The work aims at being a complete list of the floras and books, as well as papers and separates, dealing with the plants of Mexico published since the Conquest. A fair number of American authors are cited, and their botanical work reviewed briefly or at some length; among such may be mentioned Audubon, Bailey, Chapman, Eaton, Eggers, Engelmann, Gray, Parry, Pursh, Riley, Rose, Rothrock, Torrey and Trelease. Short biographical sketches of the botanists who explored Mexico, as far as known, are added, as also an account of their work while in the field and the extent and importance of their collections. Botanists of the United States, Canada and Europe not familiar with this comprehensive work would do well to procure a copy from the author or from the printer in the city of Mexico; Oficina Tip. de la Secretaria de Fomento.

2. *Informe que rinde á la Secretaria de Fomento. El Director del Instituto Médico Nacional* DR. FERNANDO ALTAMIRANO. *Sobre algunas excursiones á las Montañas del Ajusco y Serranía de las Cruces.* Mexico, 1895.

This pamphlet of some 64 pages gives an account of a new amphibian *Amblystoma Altamirani*, A. Dugés, with a colored lithographic plate of the same, as well as an account of an